

*Application No. 09/508,934
Amendment dated February 13, 2004
Reply to Office Action of November 19, 2003*

Remarks

This amendment is responsive to the final Office Action mailed November 19, 2003 in connection with the above-identified patent application. In that Action, independent claim 5 was withdrawn from further consideration under 37 C.F.R. § 1.142(b). Claims 25 and 26 were rejected Under 35 U.S.C. § 112, second paragraph. Claims 18, 19 and 22 were rejected under 35 U.S.C. § 102(b) as being anticipated by PCT Publication WO 96/22629 ("WO '629"). Lastly, claims 1, 11-17, 20, 21, 23, 24, 27, and 28 were allowed.

THE NON-ART REJECTIONS

Referring again to the Office Action, claims 25 and 26 were rejected because, according to the Examiner, the phrase "the first partial coil winding step" of claim 25 lacked antecedent basis.

Applicants have amended independent claim 11 above to provide antecedent basis to address the Examiner's concerns regarding claim 25. It is respectfully submitted that the claim is now in proper form.

THE ART REJECTIONS

With reference yet once again to the Office Action, claims 18, 19, and 22 were rejected as being anticipated by WO '629. The Examiner took the position that the claims are "product-by-Process" and that the WO '629 publication discloses the final structure of four groups of conductors on stator teeth.

Application No. 09/508,934
Amendment dated February 13, 2004
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The Present Application:

For purposes of review, the present application is directed to improvements in stator constructions and methods of winding a stator to realize an improved efficiency thereof. As described in the specification, the invention proceeds from the recognition that as a result of dividing winding procedures for coupled coils of opposite phases into partial winding steps, significant simplification is realized in the manufacturing method and improved efficiencies result.

In comparison with stators produced according known methods, the methods and apparatus of the present invention to improve magnetic coupling of the coils of the respectively opposite phases. As outlined in the specification, this can be explained in part in that with simultaneous winding of all wires of two coils according to the prior art practice, and allocation of the wire ends after the winding procedure, there was, more or less, random allocation and positioning of the individual wires within one coil. In contrast, in accordance with the present application, by separation of the windings into partial winding steps, closer proximity of the individual wires of the coils is achieved, at least on balance, for more uniform distribution resulting in improved results.

In accordance with the preferred embodiment of the invention, by winding only two wires respectively (one per coil) the two wires are placed close to each other over the entire length of the coil.

As a further benefit, the improved coupling and close proximity of the wire pairs results in an improved ability of replicating electrical properties of the stator.

Application No. 09/508,934
Amendment dated February 13, 2004
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More particularly, stators wound according to the preferred method have consistent properties overall.

Claims 18, 19, and 22 are Patentable Over WO '629:

As noted above, the Examiner took the position that claims 18, 19 and 22 were product-by-process claims and were anticipated by WO '629. The Examiner noted in the Action that WO '629 discloses the final structure recited in the claims.

It is respectfully submitted that the WO '629 document only discloses that the magnetic coupling of the coils of the four-face DC motor is improved when the corresponding coupled coils are wound on the stator core simultaneously. However, the WO '629 document does not teach that the coils can be wound on the corresponding stator teeth in more than a single step, each winding step including winding $2n$ conductor simultaneously and selecting a first and a second group of n conductors and assigning each group to a first or second coil. By separation of the winding into partial winding steps, closer proximity of the individual wires of the coils or intermingling therebetween is achieved, at least on balance, to arrive at a more uniform winding distribution as viewed in cross section through the coil. In particular, the above is especially true when winding only two wires respectively, one wire per coil, because the two wires are placed close to each other over the entire coil length.

It is respectfully submitted that the Examiner cannot ignore the steps of "selecting and repeating" in claims 18 and 19 as the steps have a decisive influence on the structure of the resultant coil wound in this manner.

*Application No. 09/508,934
Amendment dated February 13, 2004
Reply to Office Action of November 19, 2003*

The novel approach of dividing the winding process into several steps has the effect that in each step a smaller number of conductors are wound on the stator core. Thus, when dividing the $2n$ conductors into two groups and allocating each group to a first and second coil, the magnetic coupling between the two coils is improved as compared to the method of winding all conductors from the two coils in a single step.

Applicants respectfully submit that independent claims 18, 19, and 22 as amended above are patentably distinct and unobvious over the WO '629 reference. More particularly, they recite a stator having teeth and a set of conductors wound onto the teeth. The conductors are wound by performing a series of partial winding procedures. The conductor pairs are essentially "layered" onto conductors wound in previous partial winding steps. This construction, as noted above, results in improved efficiencies in the stator properties and in improved consistency between individual stators. The predetermined number of conductors are intermingled achieving a close mutual proximity.

The Examiner's attention is invited to the Substitute Specification at page 5, lines 6-22 for support for the amendments proposed herein.

It is respectfully submitted that the WO '629 patent does not teach, suggest, or fairly disclose a stator having conductors wound thereon in partial winding steps to realize the final structure of intermingled conductors having close mutual proximity to arrive at a substantially uniform winding distribution.

Application No. 09/508,934
Amendment dated February 13, 2004
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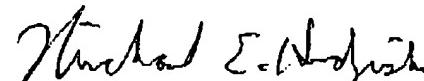
Conclusion

In view of the above amendments, comments, and arguments presented, applicants respectfully submit that all pending claims are patentably distinct and unobvious over the references of record.

Allowance of all claims and early notice to that effect is respectfully requested.

Respectfully submitted,

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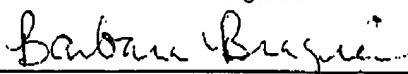

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